THE VIRTUAL CIRCUIT FUNCTION IN THE HOSPITAL

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Abstract

The virtual circuit service is a common feature of local area communications networks (LACNs). This feature provides the user of a network with the functionality of direct connectivity to any host computer on the network. At the University of California, San Francisco Hospital a microcomputer based LACN using fiberoptic communications media has been in use for over two years. (1) The hosts on the network gain access to all other hosts through a connection to a network interface unit (NIU). The NIU contains two 2-80 microprocessors with the network communications software. Hosts may be either computers or terminals of various types. One use of a virtual circuit service in this network would be for a terminal to connect directly to an NIU in the network rather than to a host CPU which is connected to an NIU. Network software would allow this terminal to establish a virtual circuit with any other host computer attached to the network. For example, a terminal could establish such a virtual circuit connection to the hospital’s clinical laboratory computer. In doing so it could be made to function as though it had a direct connection to that computer just as any one of the clinical laboratory computer terminals. Thus, the user of this terminal could function as a clinical laboratory terminal performing any function available in that computer. After disconnecting this virtual circuit the same terminal could then establish another virtual circuit to some other computer on the network, for example the hospital’s radiology computer. In doing so, this terminal then could function as a radiology terminal. It should be apparent that in a local area network with multiple hosts and multiple functions, such as is the case at UCSF, the virtual circuit service is a potentially powerful tool in providing access to a multiplicity of databases and application software functions through a single terminal.

At UCSF the sixth and most recent computer added to the network serves the function of clinical display of patient information to terminals located on nursing units and other clinical areas. This clinical display computer allows its terminals to gain access to a multiplicity of patient information available in other computers in the network, including laboratory results, x-ray reports, discharge summaries, operative diagnoses, and many other items of information. However, we did not choose to utilize the virtual circuit service in the manner described above for this purpose. After some consideration we decided not to connect the clinical display terminals directly to NIUs on the network. Rather, we chose to interpose a host computer between these terminals and...
an NIU. The reason for this decision is that the virtual circuit connection requires the terminal user to be more sophisticated than we believe to be the case for the typical nursing unit user who would be a physician, nurse, or unit secretary. That is, this configuration would not be "user friendly". Although the virtual circuit service, itself, is transparent to the user, the user must understand how to use the application software in each of the host computers. This would require a physician to have knowledge of the use of multiple computer systems each of which has different mechanisms of user interface including screen formats, input-output conventions, options, constraints, etc. Indeed, for such a user, obtaining patient clinical data would require considerable training and probable frustration. Instead it was our desire to give the nursing unit users of this clinical display system a user friendly display system which would be easy to use and give them an appearance of dealing with a single system. Interposing the sixth CPU between the terminals and the network allowed us to provide a simple and common access and display mode for all types of data. Thus, in a hospital local area network one place not to depend solely on a virtual circuit service is for the nursing unit functions whether they be results reporting, order entry, or other functions.

What, then, is the role of the virtual circuit service in the hospital setting? There are two general situations in which this service should be utilized. Both situations require a sophisticated user. The first is for the systems department personnel. The programmers, analysts, network managers, and other systems personnel, in the course of their daily work, may need to work with more than one host computer on the network. Rather than requiring these people to go from one terminal to another which is dedicated to a particular host or using dial-up modems they can be provided with terminals with direct access to NIUs. They would then have the capability to establish a virtual circuit with whatever host was needed.

The second situation in which the virtual circuit function would have utility would be in situations in which a particular user would normally be trained in the use of two or more applications functioning on two or more computers. This need not be a common experience in a hospital local area network since most users are in a functional area served by a single application, such as the pathology or the pharmacy departments. Although these departments may require access to information available on other computers, this would normally be done in a local area network through software in their own host application that would request information across the network from another computer. In this case the user would not have the functionality of a direct connection to any but their own host computer even though data may be displayed to them which was obtained from some other computer. If the needs in a single department were just a matter of obtaining transaction oriented data from some other computer this could always be handled through network mechanisms without using a virtual circuit in the manner described. However, there will be some occasions when the user in a particular department may need to perform many functions that may occur in a second computer. In this case it may be much more efficient to allow that user to gain direct connectivity through a virtual circuit to that second computer than to try to duplicate all of those other functions on their departmental application. An example has occurred in our medical records department which has an application computer performing many medical records functions. This computer is a Data General Eclipse 6/250 using the MIIS language and provides functions such as medical record tracking, word processing for transcribing of operative notes and discharge summaries, incomplete record management and a number of other functions. There is a need in the medical records department to utilize functions available on the hospital's financial systems computer for a variety of reasons. The financial systems operate on an IBM computer which will be added to the network at a future time. Rather than install terminals to the IBM computer located in the medical records department for this function it will probably be preferable to utilize some terminals already available in the medical records department with direct connections to an NIU. They could then function through virtual circuits as either a financial systems terminal or a medical records department terminal. In this example there need not be a single individual who is trained to use both the medical records computer application and the financial systems application. The same terminal devices located in that department could be used by either type of individual or by a single individual whose duties required use of both systems. Either of these options would be simpler than attempting to duplicate in the medical records computer the financial systems functions that are available on the IBM system.

In summary, the virtual circuit service is a powerful network software tool. However, its use should be limited to those situations in which the user would normally be trained in the use of the application level functions to which that terminal would be connected. It should not be used in a situation involving the casual or unsophisticated computer system user.

References


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